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Short communication

Characterisation and clonal dissemination of OXA-23-producing *Acinetobacter baumannii* in Tabriz, northwest Iran

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ABSTRACT

The characteristics and molecular epidemiology of carbapenemase genes amongst 68 imipenem-resistant *Acinetobacter baumannii* isolated from Imam Reza Hospital (Tabriz, Iran) during a 17-month period were studied. All 68 isolates were typed using sequence group-based multiplex polymerase chain reaction (PCR) to compare the clonal relationship of isolates with known international clonal lineages. Repetitive sequence-based PCR was further performed with representative isolates of each clone. PCR and sequencing were performed to detect OXA-type carbapenemases and class 1, 2 and 3 integron genes as well as to confirm the presence of insertion sequence IS*Aba1* upstream of $bla_{\text{OXA-23}}$ and $bla_{\text{OXA-51-like}}$ genes. Sixty-four isolates (94%) belonged to international clone (IC) II, two isolates (3%) belonged to IC I and two isolates (3%) did not belong to known international clones. All isolates carried $bla_{\text{OXA-51-like}}$, $bla_{\text{OXA-23}}$ and class 1 integron genes. No other acquired bla_{OXA} genes or class 2 or 3 integron genes were detected. Sequence analysis confirmed the presence of $bla_{\text{OXA-23}}$ as well as the $bla_{\text{OXA-51-like}}$ variants $bla_{\text{OXA-66}}$, $bla_{\text{OXA-69}}$ and $bla_{\text{OXA-88}}$. IS*Aba1* was present upstream of the $bla_{\text{OXA-23}}$ gene in all of the isolates. Clonal spread of OXA-23-producing *A. baumannii* emphasises the need for appropriate infection control measures to prevent further spread of these multidrug-resistant organisms.

1. Introduction

Acinetobacter baumannii has become a major nosocomial pathogen that causes severe infections, especially in patients admitted to Intensive Care Units (ICUs) [1]. In recent years, the emergence of multidrug-resistant *A. baumannii* complicates the therapy of *A. baumannii* infections and may lead to treatment failure [1,2]. Carbapenems are the drugs of choice for serious *A. baumannii* infections in many medical centres, however resistance to these antibiotics is increasing owing to the production of carbapenem-hydrolysing β-lactamases [2]. Carbapenemases found in *A. baumannii* include metallo-β-lactamases such as IMP and VIM and the recently described NDM-1 and NDM-2; however, the predominant carbapenemases belong to the class D oxacillinases (OXA enzymes) [3]. In *A. baumannii*, the OXA-type carbapenemases are classified into at least five subgroups corresponding to the intrinsic OXA-51-like and the acquired OXA-23-like, OXA-40-like, OXA-58-like and OXA-143 [4]. The insertion sequence IS*Aba1* has been found upstream of $bla_{\text{OXA-23-like}}$ and $bla_{\text{OXA-51-like}}$ genes in *A. baumannii* and leads to overexpression of bla_{OXA} genes [5].

Several studies have shown the clonal dissemination of carbapenem-resistant *A. baumannii* strains in different geographic regions, including Pakistan and military hospitals in Iraq and Kuwait in the Middle East [6,7]. Three international clones (ICs) of *A. baumannii* (ICs I, II and III, previously designated European clones I, II and III, respectively) associated with multidrug resistance have been identified [8] and there is evidence of five other worldwide carbapenem-resistant clonal lineages [9].

Few reports exist regarding the molecular epidemiology of carbapenem-resistant *A. baumannii* in Iran. The aims of this study were to identify and characterise the OXA-type carbapenemase genes, IS*Aba1* and integrons as well as the clonal relationship amongst the imipenem-resistant *A. baumannii* isolates.

2. Materials and methods

2.1. Bacterial isolates

Between May 2008 and September 2009, 68 non-repetitive imipenem-resistant isolates of *A. baumannii* were collected from Imam Reza Hospital (Tabriz, Iran). Bacterial isolates were recovered

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